

## CLAIM AMENDMENTS

1. (Currently amended) A method of making a surface covering which comprises the sequential steps of:
  - (a) applying over a substrate a plastic layer containing a foaming agent,
  - (b) heating the plastic layer to a temperature which gells the plastic layer without activating the foaming agent to form a gelled plastic layer having a surface,
  - (c) applying to the surface of the gelled plastic layer a first printing ink containing a photoinitiator in a first pattern or a first design,
  - (d) applying to the surface of the gelled ~~plastic~~ plastic layer a second printing ink containing a photoinitiator and an expansion inhibitor in a second pattern or a second design,
  - (e) applying a curable coating over the gelled plastic layer and the first and second printing inks,
  - (f) gelling the curable coating,
  - (g) heating to soften the gelled curable coating,
  - (h) mechanically embossing the softened curable coating,
  - (i) activating the photoinitiator and curing the surface areas of the curable coating disposed over the first and second printing inks,
  - (j) heating to activate the foaming agent and fuse the curable coating, the plastic layer and the substrate together, wherein foaming of the plastic layer

underlying the second printing ink is inhibited, and the mechanical embossing in surface areas disposed over unprinted areas is relaxed,

(k) optionally mechanically embossing the curable coating in areas that are not disposed over the first and second printing inks.

2. (Original) The method of claim 1 wherein the curable coating is cured following fusion by subjecting the surface covering to electron beam radiation.

3. (Original) The method of claim 2 wherein the surface covering is subjected to electron beam radiation following mechanical embossing in step (k).

4. (Original) The method of claim 1 wherein the curable coating contains a thermal crosslinking initiator and the curable coating is cured by heat during fusion.

5. (Original) The method of claim 1, further comprising applying a polyurethane coating after optionally mechanically embossing.

6. (Original) The method of claim 1, wherein the surface covering is selected from the group consisting of sheet flooring, tile and wall covering.

7. (Original) The method of claim 1, wherein the surface covering is cooled prior to heating to soften the gelled curable coating.

8. (Original) The method of claim 1, wherein the surface covering is cooled and then the surface is reheated to soften it prior to optionally mechanically embossing.

9. (Original) The method of claim 1, wherein after gelling the plastic layer the surface covering is cooled prior to applying the printing ink.

10. (Original) The method of claim 1, wherein said curable coating contains a thermal crosslinking initiator.

11. (Original) The method of claim 7, wherein said thermal crosslinking initiator is peroxide.
12. (Original) The method of claim 8, wherein said curable coating contains solid particulates.
13. (Original) The method of claim 1, further comprising applying one or more than one additional printing ink(s) to the surface of the gelled plastic layer.
14. (Original) The method of claim 13, wherein one or more than one of said additional printing ink(s) contains a photoinitiator.
15. (Original) The method of claim 13, wherein one or more than one of said additional printing ink(s) contains an inhibitor.
16. (Original) The method of claim 14, wherein one or more than one of said additional printing inks containing a photoinitiator also contains an inhibitor.
17. (Original) A method of making a surface covering which comprises the sequential steps of:
  - (a) applying a plastic layer over a substrate,
  - (b) heating the plastic layer to a temperature which gells the plastic layer,
  - (c) applying a printing ink containing a photoinitiator onto the gelled plastic layer in a pattern or a design,
  - (d) applying a curable coating over the gelled plastic layer and the printing ink,
  - (e) gelling the curable coating,

- (f) heating to soften the gelled curable coating,
- (g) mechanically embossing the softened curable coating,
- (h) activating the photoinitiator and curing the curable coating disposed over the printing ink,
- (i) heating to cure uncured portions of the curable coating and fuse the thereby cured coating, the plastic layer and the substrate together.

18. (Original) The method of claim 17 further comprising mechanically embossing the cured coating in areas that are not disposed over the printing ink.

19. (Original) The method of claim 17, further comprising applying a polyurethane coating after mechanically embossing the cured coating that is uncured.

20. (Original) The method of claim 17, wherein the surface covering is selected from the group consisting of sheet flooring, tile and wall covering.

21. (Original) The method of claim 17, wherein the surface covering is cooled prior to curing the curable coating.

22. (Original) The method of claim 17, wherein the surface covering is cooled following curing the curable coating.

23. (Original) The method of claim 17, wherein after gelling the plastic layer the surface covering is cooled prior to applying the printing ink.

24. (Original) The method of claim 17, wherein said curable coating contains a thermal crosslinking initiator.

25. (Original) The method of claim 17, wherein said thermal crosslinking initiator is peroxide.
26. (Original) The method of claim 17, wherein said curable coating contains solid particulates.
27. (Original) The method of claim 17, further comprising applying one or more than one additional printing ink(s) onto the gelled plastic layer before applying said curable coating.
28. (Original) The method of claim 27, wherein one or more than one of said additional printing ink(s) contains a photoinitiator and/or an inhibitor.
29. (Original) The method of claim 17 wherein the curable coating comprises a curable acrylic monomer and/or oligomer.
30. (Original) The method of claim 17 wherein the plastic layer contains a foaming or blowing agent, one or more than one printing ink(s) further contains an inhibitor, heating to gel the plastic layer is not sufficient to activate the foaming or blowing agent, and heating in step (i) is sufficient to activate the foaming or blowing agent and relax the mechanical embossing in surface areas disposed over areas not printed with an ink comprising a photoinitiator.
31. (Currently amended) A surface covering which comprises:
- (a) a substrate,
  - (b) a foamed and chemically embossed plastic layer overlaying the substrate,

- (c) an ink containing a photoinitiator printed in a design on said foamed plastic layer,
- (d) a cured coating or a cured layer overlaying the foamed plastic layer and ink wherein the portion of the cured coating or the cured layer disposed over the ink is chemically embossed and mechanically embossed with a first mechanically embossed texture having relatively deep emboss depths as compared with a matting grain.

32. (Original) The surface covering of claim 31 wherein the ink also contains an inhibitor.

33. (Currently amended) The surface covering of claim 31 wherein the portion of the cured coating or cured layer which is not disposed over the ink is mechanically embossed with a second mechanically embossed texture different from the first mechanically embossed texture ~~portion of the cured coating disposed over the ink.~~

34. (Original) The surface covering of claim 31 further comprising a polyurethane coating overlaying the cured coating or cured layer.

35. (Currently amended) A surface covering which comprises:

- (a) a substrate,
- (b) a plastic layer overlaying the substrate,
- (c) an ink containing a photoinitiator printed in a design on said plastic layer,

- (d) a cured coating or a cured layer overlaying the plastic layer and the ink wherein the cured coating or the cured layer overlaying the ink is mechanically embossed with a mechanically embossed texture having relatively deep emboss depths as compared with a matting grain.

36. (Original) The surface covering of claim 35 further comprising a polyurethane coating overlaying the cured and embossed cured coating or cured layer.

37. (Original) A method of making a surface covering which comprises the sequential steps of:

- (a) applying over a substrate a plastic layer containing a foaming agent,
- (b) applying to the surface of the plastic layer a first printing ink containing a photoinitiator in a first pattern or a first design,
- (c) applying to the surface of the gelled plastic layer a second printing ink containing a photoinitiator and an expansion inhibitor in a second pattern or a second design,
- (d) applying a curable layer over the plastic layer and the first and second printing inks,
- (e) heating to soften the curable layer,
- (f) mechanically embossing the softened curable layer,
- (g) activating the photoinitiator and curing the surface areas of the curable layer disposed over the first and second printing inks,

(h) heating to activate the foaming agent, cure uncured portions of the curable layer, wherein foaming of the plastic layer underlying the second printing ink is inhibited, and the mechanical embossing in surface areas disposed over unprinted areas is relaxed,

(i) optionally mechanically embossing the cured coating in areas that are not disposed over the first and second printing inks.

38. (Original) The method of claim 37, further comprising applying a polyurethane coating after optionally mechanically embossing.

39. (Original) The method of claim 37, further comprising applying additional printing ink(s) after application of said second printing ink and before applying said plastisol coating.

40. (Original) The method of claim 37 wherein the plastic layer is applied as a liquid followed by heating the plastic layer to a temperature which gels the plastic layer without activity the foaming agent to form a gelled plastic layer having a surface.

41. (Original) The method of claim 37 wherein the plastic layer is adhered over the substrate.

42. (Original) The method of claim 41 wherein the plastic layer is adhered by laminating.

43. (Original) The method of claim 37 wherein the curable layer is applied as a liquid followed by gelling the curable layer.

44. (Original) The method of claim 37 wherein the curable layer is adhered over the plastic layer and the first and second printing inks.



45. (Original) The method of claim 44 wherein the curable layer is adhered by laminating.

46. (New) The surface covering of claim 31 wherein the first mechanically embossed texture is selected from the group consisting of sand, cementitious grout, mortar, cork, terrazzo or the like.

47. (New) The surface covering of claim 33 wherein the second mechanically embossed texture is selected from the group consisting of ceramic tile, stone, brick, sandstone, cork, wood or combinations thereof.

48. (New) The surface covering of claim 35 wherein the mechanically embossed texture is selected from the group consisting of sand, cementitious grout, mortar, cork, terrazzo or the like.

## REMARKS

Please consider the foregoing amendments and the following remarks in response to the Office Action mailed on May 30, 2003.

### The Requirement of Restriction

Applicants respectfully traverse the requirement of restriction under 35 U.S.C. §121 designating Group I, claims 1-30 and 37-45 drawn to a method of making a surface covering and Group II, claims 31-36 drawn to a surface covering. Applicants affirm their provisional election made with traverse to prosecute the invention of Group II, claims 31-36, but applicants respectfully submit that the requirement of restriction should be withdrawn. Applicants argue that a search of the art relative to the product claims would uncover the relevant art to the process claims and, accordingly, it would not constitute a burden upon the Office to examine all of the claims at once. Applicants should not be put to the extra cost of filing fees and other prosecution expenses that would be associated with a divisional application directed to the provisionally nonelected group.

### The Amended Claims

Claims 31 and 35 have been amended based upon paragraph [0004] of the specification to clarify the depth of embossing which characterizes applicant's invention. Claim 33 also has been amended to make it consistent with the amendments to claim 31.

New dependent claims 46-48 have been added. Claims 46 and 48 are based upon paragraph [0013] of the specification and claim 47 is based upon paragraph

[0004] of the specification.

### The Rejection under 35 U.S.C. §102

Claims 31-33 and 35 are rejected under 35 U.S.C. §102(b) as being anticipated by Courtoy, et al., United States Patent No. Re 33,599. Courtoy was identified by the applicants and discussed in the specification of the pending application at paragraphs [0003] and [0004]. Courtoy has to do with a process for obtaining selective areas of matting on synthetic coverings and the product. As explained by applicants in paragraphs [0003] and [0004] of the pending application, the present invention is not directed to matting on surface coverings but it is directed relatively deep embossing to produce a texture, for example, to imitate cementitious grout.

Considering the disclosure of the Courtoy reference in more detail, the invention of Courtoy “provides a novel process of achieving distinctive surface textures, i.e., matting at the surface of a selected area or zone on a synthetic covering”. (See Courtoy at col. 2, ln. 59-62.) The matting of Courtoy is also referred to as graining several times in the specification of the reference and according to Courtoy the term “grained” has the same meaning as “matted”. (See Courtoy at col. 3, ln. 24-26 and 39-41 and col. 7, ln. 36-38 and 60-61.)

According to Webster’s New Collegiate Dictionary, “matting” means a dull lusterless surface (as on gilding, metalwork or satin). More specific definitions are provided by the ASTM and representative portions of the ASTM Standards on Color and Appearance Measurements are appended as Exhibit A. Accordingly, “matt” means lacking luster or gloss. (Synonymous with “flat” in paint terminology.) “Matt finish”

means a dull finish. “Matt glaze” refers to a colorless or colored ceramic glaze having low gloss. Also appended as Exhibit B are ASTM definitions for “grain” and it is particularly clear from ASTM page numbers 215 and 216 that the term “grain” is subject to various definitions including close grains or fine grains and grained leather. Courtoy’s definition of “grain” as equivalent to matting or a matting grain is accordingly consistent with acceptable definitions for the term “grain”.

Claims 31-33 and 35 cannot be anticipated by Courtoy under 35 U.S.C. §102(b) because Courtoy does not disclose a mechanically embossed texture having relatively deep embossed depths as compared with a matting grain. Withdrawal of the claim rejections under 35 U.S.C. §102 is accordingly respectfully requested.

Furthermore, there is no teaching or suggestion in Courtoy under 35 U.S.C. §103 of a surface covering having an ink containing a photoinitiator printed in a design on a foamed plastic layer and a cured coating or a cured layer overlaying the foamed plastic layer and ink wherein a portion of the cured coating or the cured layer disposed over the ink is chemically embossed and mechanically embossed with a first mechanically embossed texture having relatively deep embossed depths as compared with a matting grain.

Claim 33 requires a second mechanically embossed texture different from the first mechanically embossed texture defined by claim 31. No second mechanically embossed texture is disclosed or suggested by Courtoy.

#### The Rejection under 35 U.S.C. §103

Claims 34 and 36 are rejected under 35 U.S.C. §103(a) as being unpatentable

over Courtoy in view of Haemer, et al. (U.S. Patent No. 4,298,646). Haemer has to do with a surface covering comprising a polyurethane coating overlaying a cured coating. Claims 34 and 36 depend, respectively, from claims 31 and 35 and, as discussed above, claims 31 and 35 are neither anticipated nor obvious over Courtoy. The claim to a polyurethane coating over the patentable substrates of claims 31 and 35 must therefore be patentable and, as such, claims 34 and 36 cannot be obvious. The rejection over Courtoy in view of Haemer accordingly must be withdrawn.

#### Double Patenting

Claims 31-33 and 35 are rejected over Courtoy under the judicially created doctrine of obviousness-type double patenting. As explained above, the presently pending claims are patentably distinct from Courtoy and the double patenting rejection must therefore be withdrawn.

#### Conclusion

The Examiner is invited to telephone the undersigned at 908-252-4256 if it is believed that further discussion may help to expedite the prosecution of the application.

A Notice of Allowance is respectfully requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'William R. Robinson', is written over a horizontal line.

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CF receptor sheet on which an image is produced on application of pressure. F 549, F-5

**mated transfer paper**—a transfer paper requiring two different coatings to come into contact to develop an image. F 549, F-5

**material**—relating to, derived from, or consisting of matter. E 375, D-20

**materials engineer**—person who works with the properties of materials, usually to alter them in some manner so as to make them more useful for some application. F 1156, F-12

**materials specialist**—See **material engineer**. F 1156, F-12

**materials technician**—See **materials engineer**. F 1156, F-12

**material tests**—the quality and property tests of component materials. C 822, C-13

**material transfer**—a general term to describe the carry-over of material from one electrical contact to another.

NOTE—When the discussion becomes specific, the term “gain” or “loss” is used with respect to a particular contact (for d-c application, anode or cathode; for a-c application, stationary contact or movable contact). For example, anode gain, anode loss, stationary contact gain. B 542, B-4

**material transfer, anodic**—movement of contact metal from the anode by means of an anode arc. B 542, B-4

**material transfer, bridge**—material transfer that occurs without the presence of a gaseous electric discharge. The filament of molten contact material that connects the two separating contacts does not rupture in the middle; thus there is a gain of material on one contact and a loss of material from the other. B 542, B-4

**material transfer, cathode**—movement of contact metal from the cathode by means of a cathode arc. B 542, B-4

**material transfer, needle**—material transfer that results in a buildup with a smaller diameter and a relatively great length. B 542, B-4

**material transfer, negative**—see **material transfer**.

B 542, B-4  
**material transfer, negative**—material transfer that results in a buildup on the negative contact. Care should be used not to confuse this term with cathode transfer. B 542, B-4

**material transfer, positive**—see **material transfer**. B 542, B-4

**material transfer, positive**—material transfer that results in a buildup on the positive contact. Care should be used not to confuse this term with anodic transfer. B 542, B-4

**mat finish (matte finish)**—a dull finish. B 374, B-8

**mat-formed particleboard**—a particleboard in which the coated particles are formed first into a mat having substantially the same length and width as the finished board before being flat-platen pressed. D 1554, D-7

**mat glaze**—a colorless or colored ceramic glaze having low gloss. C 242, C-21

**mathematical model, *n***—in statistics, an equation or set of equations that describes a system. D 123, D-13

**mathematical model**—the representation of a physical system by mathematical expressions from which the behavior of the system can be deduced with known accuracy. (ISRM) D 653, D-18

**mat reinforcement**—see **quadrant mat**. C 822, C-13

**matrix**—the principal element or elements in a sample. E 135, E-1

**matrix**—the continuous phase. E 7, E-4

**matrix, *adj***—a descriptive term for a textile fiber in which one or more polymeric fibrous material(s) is dispersed in another. D 123, D-13

**matrix**—in grouting, a material in which particles are embedded, that is, the cement paste in which the fine aggregate particles of a grout are embedded. D 653, D-18

**matrix, *n***—the part of an adhesive which surrounds or engulfs embedded filler or reinforcing particles and filaments. D 907, D-14

**matrix**—See **mandrel**. B 374, B-8

**matrixed binary codes**—two-dimensional binary notation symbology; similar to an encrypted or scrambled bar code except that it is two-dimensional, not limited to only one dimension. F 1156, F-12

**matrix effects:**

**Auger**—any change of an Auger spectrum (for example, shape or signal strength) due to the physical environment (for example, amorphous/crystalline, thin layer/thick layer, or rough/smooth surface) of the emitting element and not due to chemical bonding or changes in concentration.

**SIMS**—any change in the secondary ion yields which are caused by changes in the chemical composition or structure of a particular specimen.

**AES**—see **Auger**. E 673, E-42

**matrix material (preparation of reference materials)**—the principal materials in which one or more constituents may be dispersed. C 859, C-26

**matrix metal**—the continuous phase of a polyphase alloy or mechanical mixture; the physically continuous metallic constituent in which separate particles of another constituent are embedded. B 243, B-9

**matrix of composite superconductor**—the continuous longitudinal phase of a pure metal, a polyphase alloy, or mechanical mixture that is not in the superconducting state at the normal operating conditions of the embedded superconductor. B 713, B-1

**matte**—lacking luster or gloss. (Synonymous with “flat” in paint terminology.) E 284, E-12

**matter, extractable**—See **extractable matter**. D 123, D-13

**mattress blade**—special clinching blade for fastening sisal pads in bedding plants, permitting stapling inside edging wire. F 592, F-16

**maturation (latex)**—controlled storage of compounded latex before processing. D 1566, D-11

**mature fibers, *n***—(1) (cotton fibers treated with sodium hydroxide solution)—fibers that have swollen into unconvoluted and almost rod-like shapes, where total wall width is equal to or greater than the lumen width.

(2) (cotton fibers observed under polarized light)—fibers that appear yellow, yellow green, or green and are yellow or light yellow upon rotation to the subtractive position (through 90°) and show little or no parallel extinction on removal of the selenite plate. (Compare **immature fibers**.) D 123, D-13

**maturing range**—the time-temperature range within which a ceramic body, glaze, or other composition may be fired to yield specified properties. C 242, C-21

**maturing temperature, *n***—the temperature, as a function of time and bonding condition, that produces desired characteristics in bonded components. D 907, D-14

- from, or within specified tolerances of, a specified standard color under specified conditions. (1991)
- matte**, *n*—lacking luster or gloss. Synonymous with “flat” in paint terminology.
- memory color**, *n*—color of an object that, according to the judgment of the observer, would match the color of another object previously seen by that observer. [TAPPI] (1987)
- mesopic**, *adj*—pertaining to vision at intermediate levels of illumination, at which both retinal cones and retinal rods are stimulated. (1988)
- metameric**, *adj*—(1) pertaining to spectrally different objects or color stimuli that have the same tristimulus values. [CIE]<sup>B</sup> (1988)
- (2) pertaining to objects, having different spectrophotometric curves, that match when illuminated by at least one specific spectral composition and observed by a specific observer (See also **parameric**.) [TAPPI]<sup>B</sup> (1988)
- metamers**, *n*—(1) spectrally different objects or color stimuli that have the same tristimulus values. [CIE]<sup>B</sup> (1988)
- (2) specimens differing in spectral reflectance but having colors that match in light of one spectral composition, when viewed by one observer, but may not match in light of other spectral compositions, or when viewed by another observer. See also **paramers**. (D 16)<sup>B</sup>
- mixed reflection**, *n*—partly specular and partly diffuse reflection. [CIE]<sup>B</sup> (1988)
- mixed transmission**, *n*—a combination of diffuse and regular transmission.
- modes**, *n*—of appearance, various manners in which colors can be perceived (see also **aperture mode**, **illuminant mode**, **object mode**.)
- monochromatic**, *adj*—characterized by a single wavelength or, by extension, by a small range of wavelengths that can be described by stating a single wavelength. (E 349)<sup>B</sup> (1988)
- monochromator**, *n*—a device for isolating monochromatic radiation from a beam of radiation including a broad range of wavelengths. (E 135)<sup>B</sup> (1988)
- Munsell Book of Color**, *n*—current Munsell Color Company physical exemplification of the Munsell color order system, consisting of about 1600 color chips arranged in a cylindrical coordinate system of planes of constant Munsell hue on which Munsell value is displayed vertically and Munsell chroma horizontally. (1988)
- Munsell chroma**, *n*—an attribute of color used in the Munsell color system to indicate the degree of departure of a color from a gray of the same Munsell value, in steps that are visually approximately equal in magnitude. (D 1535)<sup>B</sup>
- Munsell color system**, *n*—a system of specifying colors of surfaces illuminated by daylight and viewed by an observer adapted to daylight, in terms of three attributes: hue, value, and chroma, using scales that are perceptually approximately uniform. (D 16)<sup>B</sup>
- Munsell hue**, *n*—an attribute of color used in the Munsell color system to indicate the hue of a specimen viewed in daylight. (D 1535)<sup>B</sup>
- Munsell notation**, *n*—(1) the Munsell hue, value, and chroma assigned to the color of a specimen by visually comparing the specimen to the chips in the Munsell Book of Color. (D 1535)<sup>B</sup>
- (2) a notation in the Munsell color system, derived from luminous reflectance  $Y$  and chromaticity coordinates  $x$  and  $y$  in the 1931 CIE system for standard illuminant C, by the use of scales defined by the Optical Society of America Subcommittee on the Spacing of the Munsell Colors. (D 1535)<sup>B</sup> (1988)
- Munsell value**, *n*—an attribute of color used in the Munsell color system to indicate the lightness of a specimen viewed in daylight, on a scale extending from 0 for ideal black to 10 for ideal white, in steps that are visually approximately equal in magnitude. (D 1535)<sup>B</sup>
- Natural Color System**, *n*—color order system based on resemblances of colors to up to four of six “elementary” colors red, yellow, green, blue, black, and white, in which the attributes of the colors are hue, chromaticness, and blackness. (1988)
- NBS color difference**, *n*—color difference calculated by use of the Judd-Hunter National Bureau of Standards equations, which are unique in including terms taking account of (1) the masking effect of gloss on the detection of color differences and (2) the relative importance of chromaticness and lightness in a particular viewing arrangement, such as variation in the separation between the two specimens compared. (1988)
- neutral**, *adj*—achromatic or without hue. [TAPPI]<sup>B</sup> (1987)
- nonchromatic**, *adj*—see **achromatic**.
- nuance**, *n*—a two-dimensional attribute that distinguishes among colors having the same hue. (1990).
- object mode**, *n*—color seen as ascribed to an object.
- observation angle**, *n*—angle between the axes of the incident beam and the observed (reflected) beam, (in *retroreflection*, between the illumination axis and the observation axis).
- observer metamerism**, *n*—the property of specimens having different spectral characteristics and having the same color when viewed by one observer, but different colors when viewed by a different observer under the same conditions.
- opacity**, *n*—(1) *optical*, the ability of a specimen to prevent the transmission of light (D 16)<sup>B</sup>; the reciprocal of the transmittance factor.
- (2) *paper backing*, the ability of a sheet of paper to hide a surface behind and in contact with it, expressed as the ratio of the reflectance factor  $R_b$  when the sheet is backed by a black surface to the reflectance factor  $R_w$  when it is backed by a pile of sheets of the same kind, and of such number that further addition of sheets does not affect the measured opacity.
- (3) *white backing*, the ability of a thin film or sheet of material, such as paint or paper, to hide a surface behind and in contact with it, expressed as the ratio of the reflectance factor  $R_b$  when the material is backed by a black surface to the reflectance factor  $R_w$  when it is backed by a white surface (usually having a reflectance factor of 0.89). [ISO]<sup>B</sup> [TAPPI]<sup>B</sup>
- opacity (printing)**—see **opacity** (2) *paper backing*.
- opaque**, *adj*—transmitting no optical radiation. (1990)
- opponent-color scales**, *n*—scales that denote one color by positive scale values, the neutral axis by zero value, and an approximately complementary color by negative scale values. Common examples include scales that are positive in the red direction and negative in the green direction

diethylene and propylene glycol may be present. D 4725, D-15

**g<sub>max</sub>**—the maximum value of acceleration experienced during impact expressed in units of g's. F 869, F-8

**gnomonic projection**—a projection in which the orientation of a crystal plane at the center of the unit sphere is represented by the point where the plane normal intersects the plane of projection which is tangent to the unit sphere at the zenith. E 7, E-4

**gob**—(1) a portion of hot glass delivered by a feeder.  
 (2) a portion of hot glass gathered on a punty or pipe. C 162, C-14

**gob process**—a process whereby glass is delivered to a forming unit in "gob" form. C 162, C-14

**gold decoration**—XPS, a method whereby a very thin coat of evaporated gold on an insulator is used as a charge reference; the gold should be deposited as unconnected islands covering the area analyzed. E 673, E-42

**goniometer**—an instrument devised for measuring the angle through which a specimen is rotated. E 135, E-1

**goniometer**—an instrument devised for measuring the angle through which a specimen is rotated. E 7, E-4

**goniometry**—the measurement of the angle through which a specimen is rotated. E 375, D-20

**goniophotometer**—instrument that measures luminous flux as a function of angles of incidence or propagation. E 284, E-12

**goniophotometer, n.**—photometer for measuring the directional light distribution characteristics of sources, lighting fittings, media, and surfaces.

NOTE—A goniophotometer for measuring the spatial distribution of luminous intensity is also called a distribution photometer. E 349, E-21

**goods, heavy**—See heavy goods. D 123, D-13

**gouge**—a form of wear, consisting of a wide groove deformation accompanied by material removal and penetrating a considerable distance below the immediate flooring surface. (1971) F 141, F-6

**gouges**—see chips. D 3918, D-20

**gout, n.**—foreign matter trapped in a fabric by accident, usually lint or waste. (See also slug.) D 123, D-13

**grab bar**—See railing systems. E 631, E-6

**grab rail**—See railing systems. E 631, E-6

**grab sample**—see sampling, instantaneous. D 1356, D-22

**grab test, n.—in fabric testing**, a tensile test in which the central part of the width of the specimen is gripped in the clamps. D 123, D-13

**grab test, n.—in fabric testing**, a tension test in which only a part of the width of the specimen is gripped in the clamps. D 4439, D-35

**grab test, modified**—See modified grab test. D 123, D-13

**gradation (grain-size distribution) (texture)**—the proportions by mass of a soil or fragmented rock distributed in specified particle-size ranges. D 653, D-18

**gradation**—the distribution of particles of granular material among standard sizes usually expressed in terms of cumulative percentages larger or smaller than each of a series of sieve openings. C 822, C-13

**grade, n.**—a level or elevation of a land or water surface (Webster).

**average grade**—the arithmetic mean of the elevations of various ground surfaces within a stated area of building construction.

**finished grade**—the surface elevation of lawns, walks, drives, or other improved surfaces after completion of construction or grading operations.

**natural grade**—the elevation of the original or undisturbed surface of the ground.

**sub-grade**—the ground elevation established to receive an additional surfacing. E 631, E-6

**grade, n.—in warp knitting**, a term used to indicate the defect index evaluation of fabric determined by the number of defects per unit, for example per pound, per linear yard, or per square yard. D 123, D-13

**grade, n.—in wool and mohair**, a numerical designation used in classifying wool and mohair in their raw, semi-processed, and processed forms based on average fiber diameter and variation of fiber diameter. D 123, D-13

**grade**—the designation of the quality of logs or of a manufactured piece of wood. D 9, D-7

**grade**—the designation given a material by a manufacturer such that it is always reproduced to the same specifications established by the manufacturer. C 709, C-5

**graded aggregate seal**—an application of a bituminous material and mineral aggregate in which the aggregate is clean ¾ in. (19.0 mm) graded aggregate having 40 % minimum and 70 % maximum, passing a No. 4 (4.75 mm) sieve and a maximum of 5 % passing the No. 200 (75-µm) sieve. D 8, D-4

**grade rings**—precast concrete rings used for vertical adjustment at the top of a manhole to set manhole casting to proper grade. C 822, C-13

**gradient furnace**—a furnace within which a known temperature gradient is maintained between the two ends. Sometimes known as a Rosenhain Furnace. E 7, E-4

**graduated glassware**—glassware that is marked with one or more graduations for volumetric measuring purposes. C 162, C-14

**graduations**—series of lines on the stem of the thermometer which designate the temperature scale intervals. E 344, E-20

**graft copolymer**—a copolymer in which polymeric side chains have been attached to the main chain of a polymer of different structure. (1973) D 883, D-20

**grain**—an individual crystallite in metals. E 7, E-4

**grain**—the outer or hair side of a hide or skin. Also used as an adjective referring to that side. D 1517, D-31

**grain**—the unidirectional orientation of rubber or filler particles resulting in anisotropy of a rubber compound. D 1566, D-11

**grain**—the direction, size, arrangement, appearance, or quality of the fibers in lumber or other wood products. To have a specific meaning the term must be qualified.

**bastard sawn grain**—grain pattern in hardwood lumber in which the annual rings make angles of 30 to 60 deg with the surface of the piece.

**chipped grain**—a machine defect of surfaced lumber, where the grain of the wood has been torn out in small particles by the action of the planer knives.

**close grain**—(1) narrow, inconspicuous annual rings. The term is sometimes used to designate wood having small



and closely spaced pores, but in this sense the term "fine textured" is more often used.

(2) in stress grading, wood averaging on one end or the other of each piece not less than six nor more than 30 annual rings/in. Pieces averaging at least five or more than 30 rings/in. are accepted as close grain if containing one third or more summerwood.

**coarse grain**—wide conspicuous annual rings in which there is considerable difference between earlywood and latewood. The term is sometimes used to designate wood with large pores, such as oak, ash, chestnut, and walnut, but in this sense the term "coarse textured" is more often used.

**cross grain**—fiber deviation from a line parallel to the sides of the piece. Cross grain may be either diagonal or spiral grain or a combination of the two.

**curly grain**—grain distortion with an irregular curled appearance; "birdseye" is an extreme case of curly grain.

**diagonal grain**—grain pattern in which the annual rings are at an angle with the axis of a piece as a result of sawing at an angle with the bark of the tree or log. A form of *cross grain*.

**edge grain**—grain pattern in which the wide surfaces of the sawn piece extend approximately at right angles to the annual growth rings. Lumber is considered edge grained when the rings form an angle of 45 to 90 deg with the wide surface of the piece.

**end grain**—the grain pattern exposed when ends of logs or timbers, dimension, boards, and other wood products are cut perpendicular to the fiber direction.

**fine grain**—a synonym for *close grain*.

**flat grain**—the grain pattern resulting when lumber has been sawed in a plane approximately perpendicular to the radius of the log. Lumber is considered flat grained when the annual growth rings make an angle of less than 45 deg with the surface of the piece.

**interlocked grain**—wood in which the fibers are inclined in one direction in a number of rings of annual growth, then gradually reverse and are inclined in an opposite direction in succeeding growth rings, then reverse again.

**loosened grain**—a separation or loosening of the earlywood from the latewood due to defects in the wood or processing such as planing.

**medium grain**—used in stress grading to denote wood averaging on one end or the other of each piece not less than four annual rings/in.

**mixed grain**—lumber and other wood products unrestricted or unsegregated as to the grain angle.

**open grain**—(1) common classification related to finishing of woods with large pores, such as oak, ash, and chestnut. Also known as "coarse textured."

(2) used in stress grading to denote no limitations on rate of growth as measured by annual rings per inch.

**plainsawn**—a synonym for *flat grain*.

**quartersawn**—a synonym for *edge grain*.

**raised grain**—a condition of the surface of dressed lumber in which the hard latewood is raised above the softer earlywood but not torn loose from it.

**rift sawn**—a synonym for *edge grain*.

**slash grain**—a synonym for *flat grain*.

**spiral grain**—wood in which the fibers take a spiral course about the trunk of a tree instead of the normal vertical

course. The spiral may extend in a right-handed or left-handed direction around the tree trunk. Spiral grain is a form of cross grain.

**straight-grained wood**—wood in which the fibers run parallel to the axis of a piece.

**torn grain**—a machine defect of surfaced lumber, where the fibers of the wood have been torn out around knots and curly places by the action of the planer knives.

**vertical grain**—a synonym for *edge grain*.

**wavy-grained wood**—wood in which the fibers form a pattern of fairly uniform waves or undulations.

D 9, D-7

**grain**—synonym for filler particle.

C 709, C-5

**grain boundary**—the surface that may be closed over which a crystal is in contact with other crystals in a solid body.

F 1241, F-1

**grain boundary**—an interface separating two grains, where the orientation of the lattice changes from that of one grain to that of the other. When the orientation change is very small the boundary is sometimes referred to as a subboundary.

E 7, E-4

**grain dropping**—the dislodgement and loss of a grain or grains (crystals) from a metal surface as a result of intergranular corrosion.

G 15, G-1

**grained leather**—any leather on which the original natural grain, through any method, process, or manipulation, has been changed or altered.

D 1517, D-31

**grain growth**—an increase in the grain size of a metal, usually as a result of heating at an elevated temperature.

E 44, A-1

**grain growth**—an increase in the grain size of a metal usually as a result of heating at an elevated temperature.

E 7, E-4

**graininess**—the subjective impression caused by the granular structure in a developed photographic emulsion image.

F 127, F-1

**graininess**—the visual impression of irregularity of silver deposit in a processed film.

E 1316, E-7

**graininess**—the visual impression of irregularity of silver deposit in a processed film.

E 586, E-7

**graining**—a process for producing a decorative finish by transferring a pattern to the porcelain enamel surface by means of rolls.

C 286, B-8

**graining paste**—a mixture of color oxides, fluxes, and oils.

C 286, B-8

**graining roll**—a specialized type of roll used for transferring the grain pattern to the porcelain enamel.

C 286, B-8

**grain long**—paper grain direction in sheets of paper is parallel to the long dimension of the sheet.

F 149, F-5

**grain magnesite**—see *magnesite, grain*.

C 71, C-8

**grain short**—paper grain direction in sheets of paper is parallel to the short dimension of the sheet.

F 149, F-5

**grain size**—the dimensions of the grains or crystals in a polycrystalline metal exclusive of twinned regions and subgrains when present. Grain size is usually estimated or measured on the cross section of an aggregate of grains. Common units are: (1) average diameter, (2) average area, (3) number of grains per linear unit, (4) number of grains per unit area, and (5) number of grains per unit volume. See Methods E 112, for Determining The Average Grain Size.

(1) ASTM grain size number—a grain size designation bearing a relationship to average intercept distance at 100

diameters magnification according to the equation:  $G = \text{ASTM Grain Size Number} = 10.00 - 2 \log_2 \bar{L}$ , where  $\bar{L}$  is the average intercept distance in millimetres at 100 diameters magnification.

(2) average grain diameter—the mean diameter of an equiaxed grain section whose size is representative of all the grain sections in the aggregate being measured.

E 44, A-1

grain size—the dimensions of the grains or crystals in a polycrystalline metal exclusive of twinned regions and subgrains when present. Grain size is usually estimated or measured on the cross section of an aggregate of grains. Common units are: (1) average diameter, (2) average area, (3) number of grains per linear unit, (4) number of grains per unit area, and (5) number of grains per unit volume. See Methods E 112, for Determining Average Grain Size.

(1) ASTM grain size number—a grain size designation bearing a relationship to average intercept distance at 100 diameters magnification according to the equation:  $G = \text{ASTM grain size number} = 10.0 - 2 \log_2 \bar{L}$ , where  $\bar{L}$  is the average intercept distance in millimetres at 100 magnification.

(2) average grain diameter—the mean diameter of an equiaxed grain section whose size is representative of all the grain sections in the aggregate being measured.

E 7, E-4

grain-size analysis (mechanical analysis) (particle-size analysis)—the process of determining grain-size distribution.

D 653, D-18

grain size comparison eyepiece—an eyepiece provided with calibrated patterns representing a series of standard sizes of grains. The eyepiece must be used at a total magnification for which the patterns have been calibrated.

E 7, E-4

granite (commercial definition)—a visibly granular, igneous rock generally ranging in color from pink to light or dark gray and consisting mostly of quartz and feldspars (Note 1), accompanied by one or more dark minerals. The texture is typically homogeneous but may be gneissic or porphyritic (Note 2). Some dark granular igneous rocks, though not properly granite, are included in the definition (Note 3).

NOTE 1 Granite (scientific definition)—A visibly granular, crystalline rock with equigranular or inequigranular texture, normally having an essential composition of two feldspars (alkali feldspar plus sodic plagioclase or two alkali feldspars (see second paragraph)) and quartz; certain granites contain only one feldspar. Quartz may amount to 10 to 60 % of the felsic (light-colored) constituents, while alkali feldspars may constitute about 35 to 100 % of total feldspars. Feldspars may be present as individual grains, or may be mutually intergrown on a megascopic to submicroscopic scale. Besides quartz and feldspars, granite typically also contains varietal minerals, commonly micas or hornblende, or both, more rarely pyroxene.

Alkali feldspar refers to a range of composition between  $\text{KAlSi}_3\text{O}_8$  (potassic feldspar end member) and  $\text{NaAlSi}_3\text{O}_8$  (albite end member), with 0 to 10 % of  $\text{CaAl}_2\text{Si}_2\text{O}_8$  (anorthite end member). Potassic feldspar, which in granites is typically orthoclase or microcline, forms a nearly complete isomorphous series with the albite end member. The albite-anorthite compositional range, which may include as much as 10 % of  $\text{KAlSi}_3\text{O}_8$  in solid solution, represents a continuous isomorphous series known as plagioclase feldspars; these have been arbitrarily subdivided according to the ration of anorthite (An) to albite (Ab) at 10, 30, 50, 70, and 90 % An. The plagioclase of granite *sensu stricto* commonly is oligoclase ( $\text{An}_{10-30}$ ), less commonly albite ( $\text{An}_{0-10}$ ).

NOTE 2 Gneiss—A foliated crystalline rock composed essentially of silicate minerals with interlocking and visibly granular texture in which the foliation is due primarily to alternating layers, regular or irregular, of contrasting mineralogic composition. In general, a gneiss is characterized by relatively thick layers as compared with a schist. According to their mineralogic compositions gneisses may correspond to other crystalline rocks with visibly granular, interlocking texture, such as those included under the definition of commercial granite, and then may be known as granite gneiss, granodiorite gneiss, etc., if strongly foliated, and gneissic granite, etc., if weakly foliated. This distinction is subjective and not critical.

Porphyritic Texture—A texture defined by relatively large grains (phenocrysts), typically of feldspar, that are distributed in a distinctly finer-grained matrix. The phenocrysts of porphyritic granites generally are rectangular or partly rounded in outline, and may be as much as several centimetres in maximum dimension.

NOTE 3 Black Granites—Dark-colored igneous rocks defined by geologists as basalt, diabase, gabbro, diorite, and anorthosite are quarried as building stone, building facings, monuments, and speciality purposes and sold as black granite. The chemical and mineralogical compositions of such rocks are quite different from those of true granites, but black granites nevertheless may be satisfactorily used for some of the same purposes as commercial granite. They possess an interlocking crystalline texture but, unlike granites, they contain little or no quartz or alkali feldspar. Instead, black granites are composed dominantly of intermediate to calcic plagioclase accompanied by one or more common dark rock-forming minerals such as pyroxenes, hornblende, and biotite. Such rocks, because of their relatively high content of iron and magnesium, are designated as ferromagnesian or mafic. An exception is anorthosite which, though commonly dark, consists mostly or entirely of calcic plagioclase.

C 119, C-18

graniteware—a one-coat porcelain enameled article with a mottled pattern produced by controlled corrosion of the metal base prior to firing.

C 286, B-8

granular activated carbon—activated carbon in particle sizes predominantly greater than 80 mesh.

D 2652, D-28

granular applicator—an apparatus consisting of a hopper, a metering device, and a device for spreading or placing the granules in the target area.

E 1102, E-35

granularity—a measure of the variation in photographic density due to the nonuniform distribution of silver in a uniformly exposed and developed photographic emulsion. This variation may be transferred in contact printing.

F 127, F-1

granularity—presence of voids or discontinuities within the image giving the image a grainy appearance.

F 549, F-5

granular powder—particles having approximately equidimensional nonspherical shapes.

B 243, B-9

granulated blast-furnace slag—the glassy, granular material formed when molten blast-furnace slag is rapidly chilled, as by immersion in water.

C 125, C-9

granulated blast-furnace slag—the glassy granular material formed when molten blast-furnace slag is rapidly chilled, as by immersion in water.

NOTE 1—Granulation may be achieved by quenching blast-furnace slag from its original molten state or by quenching air-cooled blast-furnace slag after remelting.

NOTE 2—Small percentages of silica and alumina may be added while the slag is molten to enhance desired characteristics.

C 219, C-1

granulated rubber—particulate form of raw or unvulcanized compounded rubber produced by the mechanical size reduction of baled or sheeted rubber using rotary cutters or other means and with or without a coating of a parti-